ZooKeys 607: 49–68 (2016)
doi: 10.3897/zookeys.607.9391
http://zookeys.pensoft.net

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An updated list of type material of Ephemeroptera Hyatt & Arms, 1890, deposited at the Zoological Museum of Hamburg (ZMH)

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Academic editor: *E. Dominguez* | Received 31 May 2016 | Accepted 6 July 2016 | Published 26 July 2016

http://zoobank.org/F2D11E9A-5AC0-4309-BB04-B83142605624

Citation: Sartori M, Kubiak M, Rajaei H (2016) An updated list of type material of Ephemeroptera Hyatt & Arms, 1890, deposited at the Zoological Museum of Hamburg (ZMH). ZooKeys 607: 49–68. doi: 10.3897/zookeys.607.9391

Abstract

The type specimens of Ephemeroptera (Insecta) housed at the Zoological Museum of Hamburg (ZMH) are compiled in this document. The current nomenclature of all species is given. In total, Ephemeroptera type material of ZMH encompasses 161 species. Fifty-one holotypes and five lectotypes are present. Forty-one species are represented by syntypes, 85 by paratypes and five by paralectotypes. Material of two species (*Cinygma asiaticum* Ulmer, 1924 and *Pseudocloeon klapaleki* Müller-Liebenau, 1982) is missing. The present catalogue is an updated version of Weidner (1964a).

Keywords

Ephemeroptera, Hamburg, type specimens, Ulmer, ZMH

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Introduction

The Ephemeroptera collection of the Zoological Museum of Hamburg (ZMH) contains 433 species and approximately 4,500 specimens. In total, 161 species are represented by type material. In this sense, this is one of the largest collections with the highest number of type specimens of this insect order in Germany. Furthermore, the mayfly collection together with the caddisfly collection comprise some of the oldest voucher material of the entomological collection at the ZMH which was mainly collected at the end of the 19th century and in the first decades of the 20th century by the Hamburgian entomologist Dr. h.c. Georg Ulmer (1877–1963) (e.g., Weidner 1964b).

Georg Ulmer was born in Hamburg on 5 March 1877. He was the oldest son of seven siblings. After his father died in 1889, he decided to become a school teacher. During his qualification time in the early 1890s, he began collecting insects in the vicinity of Hamburg (Ulmer 1964). Initially, he started to compile a beetle collection but since he observed a mass emergence of mayflies at the river Fulda near Kassel in 1898, he started to focus his collecting efforts and taxonomic studies on primarily aquatic insect groups like mayflies or caddisflies (Ulmer 1964). In 1899, he finished his teacher training and started his career as a board school teacher in Hamburg for 32 years until 1934. Beside his profession, he studied voluntarily the faunistics, biology, systematics and taxonomy of Ephemeroptera (e.g., Ulmer 1904a, 1926, 1939) and Trichoptera (e.g., Ulmer 1905, 1951), and other freshwater invertebrates (e.g., Ulmer 1901, 1902a).

His first publication (Ulmer 1900) was followed by 175 scientific publications until his death on 15 January 1963 (Illies 1964). In the first years of his scientific career, he mainly studied the faunistics and taxonomy of caddisflies in the vicinity of Hamburg (e.g., Ulmer 1902b), or other localities in Germany (e.g. Ulmer 1904b, 1915). From the year 1905 on, he intensively started to study the material from foreign countries (including tropical regions), which has been lent to him by colleagues or other institutions (e.g., Ulmer 1905).

Besides the Trichoptera, Ulmer worked on mayflies (e.g., Ulmer 1908, 1909, 1912). Between 1904 and 1943, he published thirty research papers on the systematics and taxonomy of Ephemeroptera (Kimmins 1963; Illies 1964) with the description of 111 species (Weidner 1964a). His studies on mayflies resulted in the fundamental revision of the Southeast Asian mayfly fauna with the description of numerous species (Ulmer 1939).

During World War II (in 1943), the Zoological Museum Hamburg (that time located near the central railway station) was bombed and nearly all dry preserved material housed in the collections was destroyed and burned in the fire. Only material deposited in ethanol was transferred into the underground networks and survived the war (Weidner 1967). The valuable Ephemeroptera and Trichoptera collection of Georg Ulmer was kept in his private house outside of Hamburg. In 1964, the insect collection of Georg Ulmer was donated to the ZMH (Weidner 1964b) providing the majority of the recent voucher material of the ZMH in these two insect orders.

Table 1. List of type material of Ephemeroptera Hyatt & Arms, 1890, deposited at the Zoological Museum of Hamburg, with the state and metamorphic stage of materials, current nomenclature, family assignment, related literature and complementary information. Abbreviations in this list are as follows: Type: HT= Holotype; LT= Lectotype; PT= Paratype(s); PLT= Paralectotype(s); ST = Syntypes. (state): (1) Specimen conserved in alcohol; (2) Pinned dry specimen; (3) Specimen or part of it mounted on microscopic slide. Stage: F= Female imago; M= Male imago; N= Nymph; SF= Female subimago; SM= Male subimago. Complementary information: a. Holotype wrongly designated by Weidner (1962, 1964a); b. Holotype designated by Ulmer on the label, not in the publication; c. Holotype apparently not in Stockholm (see http://www.nrm.se/download/18.1cb760b014a762ca801342e9/1421068753427/EPHEMEROPTERA_list.pdf); d. Specimen not labelled, but comes from the type series; e. Not type material! The types are the nymphs and the adults were only described in 1925; f. Only fore- and hindlegs in ZMH; g. Only fore wing in ZMH and remains in Naturkunde Museum, Berlin; h. Only foreleg; i. Only hind wing in ZMH and remains in Naturkunde Museum, Berlin; j. Only one forewing in ZMH and remains apparently not in Stockholm (http://www.nrm.se/download/18.1cb760b014a762ca801342e9/1421068753427/EPHEMEROPTERA_list.pdf); k. Wrongly considered by Ulmer, as a syn. of *E. bellieri* (Hagen).

Taxon	Original name	Author(s), year	Type (state)	Stage	Current nomenclature	Family	Literature & Complementary information
alegrettae	*Massartella alegrettae*	Ulmer, 1943	HT (2)	M	*Massartella alegrettae* Ulmer, 1943	Leptophlebiidae	(i.)
ambiguum	*Pseudocloeon ambiguum*	Müller-Liebenau, 1982	PT (1)	N	*Liebebiella ambigua* (Müller-Liebenau, 1982)	Baetidae	Waltz and McCafferty 1987
ammophila	*Oligoneuria ammophila*	Spieth, 1938	PT (1)	N	*Homoeoneuria ammophila* (Spieth, 1938)	Oligoneuriidae	Edmunds and Allen 1957
anatolica	*Rhithrogena anatolica*	Kazanci, 1985	PT (1)	M	*Rhithrogena anatolica* Kazanci, 1985	Heptageniidae	(d.)
annandalei	*Polymitarcys annandalei*	Chopra, 1927	ST (1)	F	*Ephoron annandalei* (Chopra, 1927)	Polymitarcyidae	Hubbard and Srivastava 1985
apicatum	*Cloeon apicatum*	Navás, 1933	ST (2)	M	*Cloeon navasi* van Bruggen, 1957	Baetidae	van Bruggen 1957; (d.)
balcanicus	*Metretopus balcanicus*	Ulmer, 1920	HT (3)	M	*Metreletus balcanicus* (Ulmer, 1920)	Ameletidae	Puthz 1977a; (f.)
belgica	*Torleya belgica*	Lestage, 1917	(PT) (2)	M, F	*Torleya major* (Klapalek, 1905a)	Ephemerellidae	(e.)
bengalensis	*Ecdyonurus bengalensis*	Ulmer, 1920	HT, PT (2, 3)	M, F, SM, SF	*Ecdyonurus bengalensis* Ulmer, 1920	Heptageniidae	(b.)
berneri	*Rheobaetis berneri*	Müller-Liebenau, 1974	HT (1)	N	*Heterocloeon berneri* (Müller-Liebenau, 1974)	Baetidae	McCafferty and Provonsha 1975
bicorne	*Centroptilum bicorne*	Ulmer, 1909	PT (1)	F	*Afroptilum bicorne* (Ulmer, 1909)	Baetidae	Gillies, 1990
biobionicum	*Deleatidium biobionicum*	Ulmer, 1938	PT (2)	F	*Meridialaris biobionica* (Ulmer, 1938)	Leptophlebiidae	Peters and Edmunds 1972; (g.)

Taxon	Original name	Author(s), year	Type (state)	Stage	Current nomenclature	Family	Literature & Complementary information
bishopi	*Platybaetis bishopi*	Müller-Liebenau, 1980a	HT (1)	N	*Platybaetis bishopi* Müller-Liebenau, 1980	Baetidae	
boettgeri	*Pseudocloeon boettgeri*	Ulmer, 1924	ST (1, 2, 3)	M, F	*Pseudocloeon boettgeri* Ulmer, 1924	Baetidae	
borneonia	*Epeorella borneonia*	Ulmer, 1939	LT, PLT (1, 2)	M, F, SF	*Epeorella borneonia* Ulmer, 1939	Heptageniidae	Sartori 2014c; (a.)
braueri	*Hagenulodes braueri*	Ulmer, 1920	PT (1)	M	*Hagenulodes braueri* Ulmer, 1920	Leptophlebiidae	
brenneriana	*Rhithrogena brenneriana*	Klapalek, 1905a	PT (1)	M	*Rhithrogena alpestris* Eaton, 1885 (syn.)	Heptageniidae	Puthz 1975
brunneum	*Cloeon brunneum*	Esben-Petersen, 1909	ST (1, 2)	M, F	*Americabaetis peterseni* (Hubbard, 1974) (syn. obj.)	Baetidae	Lugo-Ortiz and McCafferty 1999
caenoides	*Neoephemeropsis caenoides*	Ulmer, 1939	LT, PLT (1, 3)	M, F, N	*Potamanthellus caenoides* (Ulmer, 1939)	Neoephemeridae	Bae and McCafferty 1998
camerunense	*Pseudocloeon camerunense*	Ulmer, 1920	ST (1, 3)	M, F	*Ophelmatostoma camerunense* (Ulmer, 1920)	Baetidae	Gillies et al. 1990
canariensis	*Baetis canariensis*	Müller-Liebenau, 1971	HT, PT (1)	M, N	*Baetis canariensis* Müller-Liebenau, 1971	Baetidae	
cavum	*Cinygma cavum*	Ulmer, 1927	PT (1)	M	*Cinygmula cava* (Ulmer, 1927)	Heptageniidae	Levanidova 1972
chinensis	*Baetis chinensis*	Ulmer, 1936	ST (1)	M, F	*Baetis chinensis* Ulmer, 1936	Baetidae	
chinensis	*Heptagenia chinensis*	Ulmer, 1920	ST (2)	M	*Heptagenia chinensis* Ulmer, 1920	Heptageniidae	(d.)
chinensis	*Siphluriscus chinensis*	Ulmer, 1920	PT (3)	M	*Siphluriscus chinensis* Ulmer, 1920	Siphluriscidae	(f.)
corsicus	*Ecdyonurus corsicus*	Esben-Petersen, 1912a	PT (2)	M	*Ecdyonurus corsicus* Esben-Petersen, 1912	Heptageniidae	Belfiore 1987; (k.)
costaricanus	*Leptohyphes costaricanus*	Ulmer, 1920	HT (2, 3)	F	*Tricorythodes costaricanus* (Ulmer, 1920)	Leptohyphidae	Bamgardner 2008
crassinervis	*Polyplocia crassinervis*	Ulmer, 1939	PT (2)	SM	*Polyplocia campylociella* Ulmer, 1939 (syn.)	Euthyplociidae	Demoulin 1953
croaticus	*Siphlonurus croaticus*	Ulmer, 1920	PT (1, 3)	M	*Siphlonurus croaticus* Ulmer, 1920	Siphlonuridae	
curvata	*Paraleptophlebia curvata*	Ulmer, 1927	PT (1, 3)	M	*Paraleptophlebia strandii* (Eaton, 1901) (syn.)	Leptophlebiidae	Kluge 2009
deigma	*Liebebiella deigma*	Waltz & McCafferty, 1987	HT, PT (1, 3)	N	*Liebebiella vera* (Müller-Liebenau, 1981) (syn.)	Baetidae	Kluge and Novikova 2011
difficilum	*Pseudocloeon difficilum*	Müller-Liebenau, 1982	PT (1, 3)	N	*Liebebiella difficila* (Müller-Liebenau, 1982)	Baetidae	Waltz and McCafferty 1987
diptera	*Hagenulopsis diptera*	Ulmer, 1920	ST (1)	M, SM, SF	*Hagenulopsis diptera* Ulmer, 1920	Leptophlebiidae	

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duporti	*Ephemera duporti*	Lestage, 1921	PT (2)	M	*Ephemera duporti* Lestage, 1921	Ephemeridae	
eatoni	*Rhithrogena eatoni*	Esben-Petersen, 1912a	PT (2)	F	*Rhithrogena eatoni* Esben-Petersen, 1912	Heptageniidae	(d.)
edmundsi	*Platybaetis edmundsi*	Müller-Liebenau, 1980b	HT (1)	N	*Platybaetis edmundsi* Müller-Liebenau, 1980	Baetidae	
ehrhardti	*Thraulus ehrhardti*	Ulmer, 1920	ST (1, 2, 3)	M, F	*Needhamella ehrhardti* (Ulmer, 1920)	Leptophlebiidae	Dominguez and Flowers 1989
eloisae	*Derlethina eloisae*	Sartori, 2008	PT (1)	N	*Derlethina eloisae* Sartori, 2008	Teloganodidae	Sartori et al. 2008
feuernborni	*Pseudoligoneuria feuernborni*	Ulmer, 1939	ST (1, 3)	N	*Chromarcys magnifica* Navás, 1932 (syn.)	Oligoneuriidae	Kluge 2004
flexus	*Siphlurus flexus*	Clemens, 1913	PT (1)	M	*Siphloplecton basale* (Walker, 1853) (syn.)	Metretopodidae	McDunnough 1924
fluviatile	*Cloeon fluviatile*	Ulmer, 1920	PT (1, 3)	M, F	*Cloeon fluviatile* Ulmer, 1920	Baetidae	
formosana	*Ephemera formosana*	Ulmer, 1920	PT (2, 3)	M, F, SM, SF	*Ephemera formosana* Ulmer, 1920	Ephemeridae	
formosanus	*Chirotonetes formosanus*	Ulmer, 1912	ST (1, 2, 3)	M, SF	*Isonychia formosana* (Ulmer, 1912)	Isonychiidae	Ueno 1931
fruhstorfferi	*Massartella fruhstorfferi*	Ulmer, 1943	PT	SF	*Massartella brieni* (Lestage, 1924) (syn.)	Leptophlebiidae	Pescador and Peters 1990
fuegiensis	*Ameletus fuegiensis*	Lestage, 1935	HT (1, 3)	N	*Metamonius anceps* (Eaton, 1885) (syn.)	Nesameletidae	Mercado and Elliott 2004
fulmeki	*Acentrella fulmeki*	Ulmer, 1939	HT, PT (1, 3)	M, F	*Labiobaetis fulmeki* (Ulmer, 1939)	Baetidae	McCafferty and Waltz 1995
fusca	*Atalophlebia fusca*	Ulmer, 1920	HT (1)	M	*Koorrnonga fusca* (Ulmer, 1920)	Leptophlebiidae	Campbell and Suter 1988; (c.)
gornostajevi	*Epeorus gornostajevi*	Tshernova, 1981	PT (1)	M	*Epeorus gornostajevi* Tshernova, 1981	Heptageniidae	
grandis	*Chirotonetes grandis*	Ulmer, 1913	ST (1, 3)	M	*Isonychia grandis* (Ulmer, 1913)	Isonychiidae	Ulmer 1924
guranica	*Heptagenia guranica*	Belov, 1981	PT (1)	M	*Heptagenia guranica* Belov, 1981	Heptageniidae	
haenschi	*Euthyplocia haenschi*	Ulmer, 1942	PT (2)	M	*Euthyplocia haenschi* Ulmer, 1942	Euthyplociidae	
horai	*Potamanthellus horai*	Lestage, 1930	HT (2)	SM	*Potamanthellus amabilis* (Eaton, 1892) (syn.)	Neoephemeridae	Bae and McCafferty 1998
hutanis	*Dudgeodes hutanis*	Sartori, 2008	PT (1)	N	*Dudgeodes hutanis* Sartori, 2008	Teloganodidae	Sartori et al. 2008

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hyalinus	*Ecdyonurus hyalinus*	Ulmer, 1912	ST (1, 2, 3)	M, F, SM, SF	*Afronurus hyalinus* (Ulmer, 1912)	Heptageniidae	Kang and Yang 1994
insularis	*Rhithrogena insularis*	Esben-Petersen, 1913	PT (2)	M, F	*Rhithrogena insularis* Esben-Petersen, 1913	Heptageniidae	(d.)
irina	*Cinygmula irina*	Tshernova & Belov, 1982	PT (1)	M	*Cinygmula irina* Tshernova & Belov, 1982	Heptageniidae	
jacobsoni	*Tricorythus jacobsoni*	Ulmer, 1913	ST (1, 3)	M, F	*Sparsorythus jacobsoni* (Ulmer, 1913)	Tricorythidae	Sroka and Soldán 2008; (a.)
japonicus	*Chirotonetes japonicus*	Ulmer, 1920	ST (1, 2, 3)	M, F	*Isonychia japonica* (Ulmer, 1920)	Isonychiidae	Ueno 1931; (a.)
javanicus	*Afronurus javanicus*	Ulmer, 1939	HT (1)	M	*Afronurus javanicus* Ulmer, 1939	Heptageniidae	
javanicus	*Baetis javanicus*	Ulmer, 1913	ST (1, 2, 3)	F	*Baetis javanicus* Ulmer, 1913	Baetidae	
jorgenseni	*Campsurus jorgenseni*	Esben-Petersen, 1912b	ST (1)	M, F	*Campsurus jorgenseni* Esben-Petersen, 1912	Polymitarcyidae	
jorgenseni	*Cloeon jorgenseni*	Esben-Petersen, 1909	ST (1, 3)	M, F	*Americabaetis jorgenseni* (Esben-Petersen, 1909)	Baetidae	Lugo-Ortiz and McCafferty 1999
karnyi	*Hagenulus karnyi*	Ulmer, 1939	ST (1, 3)	SM, SF	*Choroterpes* (*Euthraulus*) *karnyi* (Ulmer, 1939)	Leptophlebiidae	Peters and Edmunds 1970
kraepelini	*Pseudocloeon kraepelini*	Klapalek, 1905b	LT, PLT (1, 3)	M, SM	*Pseudocloeon kraepelini* Klapaleck, 1905	Baetidae	Waltz and McCafferty 1985
krieghoffi	*Chitonophora krieghoffi*	Ulmer, 1920	ST (2)	M, S	*Ephemerella mucronata* (Bengtsson, 1909) (syn.)	Ephemerellidae	Jacob 1974
lacuscoerulei	*Tasmanophlebia lacuscoerulei*	Tillyard, 1933	PT (1)	SF	*Tasmanophlebia lacuscoerulei* Tillyard, 1933	Oniscigastridae	(d.)
laminatum	*Deleatidum laminatum*	Ulmer, 1920	PT (3)	M	*Meridialaris laminata* (Ulmer, 1920)	Leptophlebiidae	Peters and Edmunds 1972; (h.)
lamuriensis	*Thalerosphyrus lamuriensis*	Sartori, 2014e	HT, PT (1, 3)	N	*Thalerosphyrus lamuriensis* Sartori, 2014	Heptageniidae	
latifrons	*Cinygmula latifrons*	Tshernova & Belov, 1982	PT (1)	M	*Cinygmula hirasana* (Imanishi, 1935) (syn.)	Heptageniidae	Kluge 1995
latus	*Tricorythus latus*	Ulmer, 1916	PT (1, 2, 3)	M	*Tricorythus latus* Ulmer, 1916	Tricorythidae	
lestagei	*Atalophlebiodes lestagei*	Ulmer, 1938	ST (1, 3)	N	*Meridialaris lestagei* (Ulmer, 1938)	Leptophlebiidae	Dominguez et al. 2006

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lieftincki	*Heptagenia lieftincki*	Ulmer, 1939	HT, PT (1, 3)	M, F	*Compsoneuria lieftincki* (Ulmer, 1939)	Heptageniidae	Sartori 2014a
lobatus	*Ecdyonurus lobatus*	Ulmer, 1924	ST (1, 2, 3)	M, F, SF	*Afronurus lobatus* (Ulmer, 1924)	Heptageniidae	Mol 1987
longilobata	*Leptophlebia longilobata*	Tshernova, 1928a	PT (1, 3)	M	*Paraleptophlebia longilobata* (Tshernova, 1928)	Leptophlebiidae	Tiunova and Kluge 2016
longus	*Tricorythus longus*	Ulmer, 1916	PT (1, 2, 3)	M, F	*Tricorythus longus* Ulmer, 1916	Tricorythidae	
lucida	*Atalophlebia lucida*	Ulmer, 1920	HT (1)	M	*Thraulophlebia lucida* (Ulmer, 1920)	Leptophlebiidae	Demoulin 1955; (c.)
macedonicus	*Rhoenanthus macedonicus*	Ulmer, 1920	HT (2)	M	*Neoephemera maxima* (Joly, 1871)	Neoephemeridae	Bae and McCafferty 1998
maculipennis	*Thraulus maculipennis*	Ulmer, 1920	HT (1)	M	*Hermanella maculipennis* (Ulmer, 1920)	Leptophlebiidae	Dominguez and Flowers 1989
magnificus	*Rhoenanthus magnificus*	Ulmer, 1920	PT (1, 2, 3)	M	*Rhoenanthus magnificus* Ulmer, 1920	Potamanthidae	
major	*Choroterpides major*	Ulmer, 1939	HT, PT (1, 3)	M, N	*Dilatognathus major* (Ulmer, 1939)	Leptophlebiidae	Kluge 2012
malaisei	*Cinygma malaisei*	Ulmer, 1927	PT (1, 3)	M	*Cinygmula malesei* (Ulmer, 1927)	Heptageniidae	Levanidova 1972
marginatus	*Thraulus marginatus*	Ulmer, 1913	ST (1, 3)	M, F	*Choroterpes* (*Euthraulus*) *marginatus* (Ulmer, 1913)	Leptophlebiidae	Peters and Edmunds 1970
media	*Ephemera media*	Ulmer, 1936	ST (2)	M, F, SM, SF	*Ephemera media* Ulmer, 1936	Ephemeridae	(a.)
media	*Teloganopsis media*	Ulmer, 1939	HT, PT (1, 3)	M, N	*Teloganopsis media* Ulmer, 1939	Ephemerellidae	Ubero-Pascal and Sartori 2009; Sartori 2014f; (d.)
melli	*Thalerosphyrus melli*	Ulmer, 1926	PT (2, 3)	M, F	*Epeorus melli* (Ulmer, 1926)	Heptageniidae	Zhou et al. 2007
mexicana	*Heptagenia mexicana*	Ulmer, 1920	PT (3)	M	*Maccaffertium mexicanum* (Ulmer, 1920)	Heptageniidae	Wang and McCafferty 2004; (f.)
mjoebergi	*Euphyurus mjoebergi*	Ulmer, 1917	PT (1, 3)	M	*Ulmerophlebia mjoebergi* (Ulmer, 1917)	Leptophlebiidae	Demoulin 1955
montium	*Thraulus montium*	Ulmer, 1943	HT (2)	M	*Traverella montium* (Ulmer, 1943)	Leptophlebiidae	Allen 1973
multus	*Baetis multus*	Müller-Liebenau, 1984	PT (3)	N	*Labiobaetis multus* (Müller-Liebenau, 1984)	Baetidae	McCafferty and Waltz 1995
nasuta	*Heptagenia nasuta*	Ulmer, 1939	ST (1, 2)	M, F	*Trichogenia nasuta* (Ulmer, 1939)	Heptageniidae	Webb et al. 2006; (a)
natans	*Chankagenesia natans*	Buldowsky, 1935	PT (1)	M, F	*Chankagenesia natans* Buldowsky, 1935	Palingeniidae	
necatii	*Ecdyonurus necatii*	Kazanci, 1987	PT (1)	SM	*Electrogena necatii* (Kazanci, 1987)	Heptageniidae	Kazanci 2001

Taxon	Original name	Author(s), year	Type (state)	Stage	Current nomenclature	Family	Literature & Complementary information
necopinatus	*Baetis necopinatus*	Müller-Liebenau, 1981	HT (1, 3)	M	*Labiobaetis necopinatus* (Müller-Liebenau, 1981)	Baetidae	McCafferty and Waltz 1995
nigrescens	*Baetis nigrescens*	Navás, 1932	ST (2)	M	*Baetis nigrescens* Navás, 1932	Baetidae	Müller-Liebenau 1971
nigrescens	*Tasmanophlebia nigrescens*	Tillyard, 1933	PT (1)	F, N	*Tasmanophlebia nigrescens* Tillyard, 1933	Oniscigastridae	(d.)
nigropunctata	*Caenis nigropunctata*	Klapalek, 1905b	ST (2, 3)	F	*Caenis nigropunctata* Klapalek, 1905	Caenidae	Malzacher 2015
nigropunctatula	*Caenis nigropunctatula*	Malzacher, 2015	HT, PT (1, 3)	M, F	*Caenis nigropunctatula* Malzacher, 2015	Caenidae	
nitidum	*Centroptilum nitidum*	Ulmer, 1916	ST (2)	F	*Bugilliesia nitida* (Ulmer, 1916)	Baetidae	Lugo-Ortiz and McCafferty 1996
novatus	*Baetis novatus*	Müller-Liebenau, 1981	HT (3)	N	*Baetis novatus* Müller-Liebenau, 1981	Baetidae	
obscurum	*Pseudocloeon obscurum*	Ulmer, 1913	ST (3)	M	*Pseudocloeon obscurum* Ulmer, 1913	Baetidae	Müller-Liebenau 1981
olivascens	*Baetis olivascens*	Ulmer, 1939	HT, PT (1, 3)	M, SM, SF	*Baetis olivascens* Ulmer, 1939	Baetidae	
operosus	*Baetis operosus*	Müller-Liebenau, 1984	PT (3)	N	*Labiobaetis operus* (Müller-Liebenau, 1984)	Baetidae	McCafferty and Waltz 1995
orientale	*Pseudocloeon orientale*	Müller-Liebenau, 1982	PT (1)	N	*Liebebiella orientale* (Müller-Liebenau, 1982)	Baetidae	Waltz and McCafferty 1987
orientalis	*Palingenia orientalis*	Chopra, 1927	PT (2)	M	*Palingenia orientalis* Chopra, 1927	Palingeniidae	
orientalis	*Raptobaetopus orientalis*	Müller-Liebenau, 1978	HT (3)	N	*Baetopus orientalis* (Müller-Liebenau, 1978)	Baetidae	Jacob 1991
ornata	*Rhithrogeniella ornata*	Ulmer, 1939	HT, PT (1, 3)	M, F	*Rhithrogeniella ornata* Ulmer, 1939	Heptageniidae	Sartori 2014d
ornatum	*Procloeon ornatum*	Tshernova, 1928b	LT (1, 3)	M	*Procloeon ornatum* Tshernova, 1928	Baetidae	Sowa 1975
paradoxa	*Anagenesia paradoxa*	Buldowsky, 1935	PT (1)	M, F	*Anagenesia paradoxa* Buldowsky, 1935	Palingeniidae	
parvus	*Ecdyonurus parvus*	Ulmer, 1912	ST (1, 2, 3)	M, F	*Rhithrogena parva* (Ulmer, 1912)	Heptageniidae	Sartori 2014b
patagonica	*Atalophlebia patagonica*	Lestage, 1931	HT (1, 3)	F	*Meridialaris patagonica* (Lestage, 1931)	Leptophlebiidae	Peters and Edmunds 1972
pekinensis	*Caenis pekinensis*	Malzacher, 2016	HT, PT (1,3)	N	*Caenis pekinensis* Malzacher, 2016	Caenidae	

Taxon	Original name	Author(s), year	Type (state)	Stage	Current nomenclature	Family	Literature & Complementary information
pekingensis	*Baetis pekingensis*	Ulmer, 1936	HT, PT (1)	M, F, SM, SF	*Alainites pekingensis* (Ulmer, 1936)	Baetidae	Waltz et al. 1994
peruvianus	*Baetis peruvianus*	Ulmer, 1920	ST (2)	M, SM	*Andesiops peruvianus* (Ulmer, 1920)	Baetidae	Lugo-Ortiz and McCafferty 1999
pescadori	*Jubabaetis pescadori*	Müller-Liebenau, 1980b	HT (3)	N	*Jubabaetis pescadori* Müller-Liebenau, 1980	Baetidae	
peterseni	*Leptohyphes peterseni*	Ulmer, 1920	ST (1, 3)	M, F, SM, SF	*Leptohyphes peterseni* Ulmer, 1920	Leptohyphidae	
petersi	*Rheobaetis petersi*	Müller-Liebenau, 1974	HT (1)	M, N	*Heterocloeon petersi* (Müller-Liebenau, 1974)	Baetidae	McCafferty and Provonsha 1975
philippinensis	*Caenodes philippinensis*	Ulmer, 1924	ST (1, 2, 3)	M	*Caenis philippinensis* (Ulmer, 1924)	Caenidae	Kluge 1985
pictipennis	*Ephemera pictipennis*	Ulmer, 1924	ST (2)	M, F	*Ephemera pictipennis* Ulmer, 1924	Ephemeridae	
powelli	*Lachlania powelli*	Edmunds, 1951	PT (1)	M, F, N	*Lachlania saskatschevanensis* Ide, 1941 (syn.)	Oligoneuriidae	McCafferty 1996
proba	*Choroterpes proba*	Ulmer, 1939	ST (1, 3)	N	*Choroterpes proba* Ulmer, 1939	Leptophlebiidae	
prominens	*Habrophlebiodes prominens*	Ulmer, 1939	HT (1, 3)	M	*Habrophlebiodes prominens* Ulmer, 1939	Leptophlebiidae	
pseudorhodani	*Baetis pseudorhodani*	Müller-Liebenau, 1971	HT, PT (1)	M, N	*Baetis pseudorhodani* Müller-Liebenau, 1971	Baetidae	
puigae	*Teloganopsis puigae*	Ubero-Pascal & Sartori, 2009	PT (1)	N	*Teloganopsis puigae* Ubero-Pascal & Sartori, 2009	Ephemerellidae	
pulcher	*Afronurus pulcher*	Ulmer, 1930	PT (1)	SM, SF	*Afronurus collarti* (Navás, 1930) (syn.)	Heptageniidae	Demoulin 1956
purpurata	*Ephemera purpurata*	Ulmer, 1920	PT (2)	M	*Ephemera purpurata* Ulmer, 1920	Ephemeridae	
ranauensis	*Caenis ranauensis*	Malzacher, 2015	HT, PT (1, 3)	M, F	*Caenis ranauensis* Malzacher, 2015	Caenidae	
rhenicola	*Caenis rhenicola*	Malzacher, 1976	HT, PT (1)	M	*Caenis pusilla* Navás, 1913 (syn.)	Caenidae	Alba-Tercedor and Malzacher 1986
rossicus	*Ecdyonurus rossicus*	Tshernova, 1928b	PT (1)	M	*Kageronia fuscogrisea* (Retzius, 1783) (syn.)	Heptageniidae	Puthz 1977b
sauteri	*Ephemera sauteri*	Ulmer, 1912	PT (2)	M, F	*Ephemera sauteri* Ulmer, 1912	Ephemeridae	
scotti	*Caenis scotti*	Ulmer, 1930	PLT (1)	M, F	*Caenis scotti* Ulmer, 1930	Caenidae	
seminiger	*Simothraulus seminiger*	Ulmer, 1939	HT (1)	M	*Simothraulus seminiger* Ulmer, 1939	Leptophlebiidae	Grant and Peters 1993
sexfasciata	*Atalophlebia sexfasciata*	Ulmer, 1916	HT (1, 3)	M	*Atalomicria sexfasciata* (Ulmer, 1916)	Leptophlebiidae	Harker 1954; (j.)

Taxon	Original name	Author(s), year	Type (state)	Stage	Current nomenclature	Family	Literature & Complementary information
sikorai	*Euthyplocia sikorai*	Vayssière, 1895	PT (1, 3)	N	*Proboscidoplocia sikorai* (Vayssière, 1895)	Euthyplociidae	Demoulin 1966
sinensis	*Iron sinensis*	Ulmer, 1926	PT (2, 3)	M	*Epeorus sinensis* (Ulmer, 1926)	Heptageniidae	Edmunds and Traver 1954
soror	*Baetis soror*	Ulmer, 1908	ST (1)	M, F	*Offadens soror* (Ulmer, 1908)	Baetidae	Lugo-Ortiz and McCafferty 1998
sowai	*Rhithrogena sowai*	Puthz, 1972	HT (2)	M	*Rhithrogena sowai* Puthz, 1972	Heptageniidae	
sudanense	*Centroptilum sudanense*	Ulmer, 1916	PT (1)	M, SM	*Bugilliesia sudanense* (Ulmer, 1916)	Baetidae	Lugo-Ortiz and McCafferty 1996
sumatrana	*Baetis sumatrana*	Ulmer, 1939	ST (1, 3)	M, F	*Baetis sumatrana* Ulmer, 1939	Baetidae	Müller-Liebenau 1981
sumatranus	*Ecdyonurus sumatranus*	Ulmer, 1939	HT (1, 3)	F	*Rhithrogena sumatrana* (Ulmer, 1939)	Heptageniidae	Sartori 2014b
thienemanni	*Compsoneuriella thienemanni*	Ulmer, 1939	LT, PLT (1, 2, 3)	M, F, N	*Compsoneuriella thienemanni* Ulmer, 1939	Heptageniidae	Sartori 2014a
tibiale	*Cinygma tibiale*	Ulmer, 1920	PT (1, 3)	M	*Rhithrogena tibiale* (Ulmer, 1920)	Heptageniidae	Tshernova and Belov 1982
tibialis	*Atopopus tibialis*	Ulmer, 1920	PT (2, 3)	M, F	*Atopopus tibialis* Ulmer, 1920	Heptageniidae	
traverae	*Rheobaetis traverae*	Müller-Liebenau, 1974	HT (1)	N	*Heterocloeon curiosum* (McDunnough, 1923) (syn.)	Baetidae	McCafferty and Provonsha 1975
triangularis	*Siphlonurus triangularis*	Clemens, 1915	PT (1)	M, F, N	*Siphlonurus quebecensis* (Provancher, 1878) (syn.)	Siphlonuridae	McDunnough 1925
truncatus	*Campsurus truncatus*	Ulmer, 1920	PT (2)	M, F	*Campsurus truncatus* Ulmer, 1920	Polymitarcyidae	
ulmeri	*Asionurus ulmeri*	Braasch & Soldán, 1986	HT, PT (1, 3)	N	*Asionurus ulmeri* Braasch & Soldán, 1986	Heptageniidae	
ulmeri	*Baetis ulmeri*	Müller-Liebenau, 1981	HT (1, 3)	M	*Labiobaetis ulmeri* (Müller-Liebenau, 1981)	Baetidae	McCafferty and Waltz 1995
ulmeri	*Behningia ulmeri*	Lestage, 1930	HT (1)	N	*Behningia ulmeri* Lestage, 1930	Behningiidae	
ulmeri	*Dudgeodes ulmeri*	Sartori, 2008	HT, PT (1, 3)	M, SM, F, N	*Dudgeodes ulmeri* Sartori, 2008	Teloganodidae	Sartori et al. 2008 Sartori 2014f
ulmeri	*Trichogenia ulmeri*	Braasch & Webb, 2006	HT, PT (1, 3)	N	*Trichogenia ulmeri* Braasch & Webb, 2006	Heptageniidae	

Taxon	Original name	Author(s), year	Type (state)	Stage	Current nomenclature	Family	Literature & Complementary information
ulmeriana	*Caenis ulmeriana*	Malzacher, 2015	HT, PT (1, 3)	M, F	*Caenis ulmeriana* Malzacher, 2015	Caenidae	
umbrata	*Teloganella umbrata*	Ulmer, 1939	HT (1)	SF	*Teloganella umbrata* Ulmer, 1939	Teloganellidae	
unguicularis	*Euphyurus unguicularis*	Ulmer, 1917	PT (1)	M	*Austrophlebiodes unguicularis* (Ulmer, 1917)	Leptophlebiidae	Campbell and Suter 1988
unguiculatus	*Campsurus unguiculatus*	Ulmer, 1920	ST (2)	M	*Tortopsis unguiculatus* (Ulmer, 1920)	Polymitarcyidae	Molineri 2010
ussingi	*Rhithrogena ussingi*	Esben-Petersen, 1910	PT (2)	M	*Rhithrogena germanica* Eaton, 1885 (syn.)	Heptageniidae	Sowa 1971
verum	*Pseudocloeon verum*	Müller-Liebenau, 1982	PT (1, 3)	N	*Liebebiella vera* (Müller-Liebenau, 1981)	Baetidae	Waltz and McCafferty 1987
virens	*Cloeon virens*	Klapalek, 1905b	ST (2, 3)	M, F	*Cloeon virens* Klapalek, 1905	Baetidae	
vitellinum	*Centroptilum vitellinum*	Ulmer, 1939	HT (2)	M	*Centroptilum vitellinum* Ulmer, 1939	Baetidae	
winckleri	*Isonychia winckleri*	Ulmer, 1939	ST (2)	M, F, SF	*Isonychia winckleri* Ulmer, 1939	Isonychiidae	(a.)
wui	*Leptophlebia wui*	Ulmer, 1936	ST (1)	M, F	*Leptophlebia wui* Ulmer, 1936	Leptophlebiidae	
wui	*Caenis wui*	Malzacher, 2016	HT, PT (1,3)	N	*Caenis wui* Malzacher, 2016	Caenidae	
Missing material							
asiaticum	*Cinygma asiaticum*	Ulmer, 1924	ST (2)	M	*Incertae sedis*	Heptageniidae	Tshernova and Belov 1982
klapaleki	*Pseudocloeon klapaleki*	Müller-Liebenau, 1982	PT (1)	N	*Liebebiella klapaleki* (Müller-Liebenau, 1982)	Baetidae	Waltz and McCafferty 1987

Georg Ulmer was an outstanding specialist and his comprehensive studies on the faunistics and taxonomy of various groups of freshwater invertebrates formed the foundation of the recent taxonomy and systematics of those groups, especially Ephemeroptera and Trichoptera.

In addition to Ulmer's collection, the ZMH also stores primary type material described by other authors, such as Klapalek (1905a,b), Lestage (1930, 1935), Malzacher (1976, 2015, 2016), Müller-Liebenau (1971, 1974, 1980a, b, 1981), and Sartori (2008, 2014e). An interesting finding was the discovery of several paratypes of species described by Esben-Petersen (e.g. 1909, 1912a, b, 1913), which were not labelled as such but come from the type series, judging from the dates and places on labels. More information on these mayfly specialists can be found at http://www.ephemeroptera.de/inhaltsverz_deutsch/Galerie____/galerie____.html, a webpage maintained by Udo Jacob and Arne Haybach.

The only attempt, prior to this type catalogue, has been made by Weidner (1962, 1964a, 1977), who published a list of Ephemeroptera type material deposited in ZMH, without any taxonomic remarks. At that time, 121 species were mentioned. This catalogue is accessible online (https://www.cenak.uni-hamburg.de/sammlungen/zoologie/entomologie/typenkatalog.html).

Multiple subsequent taxonomic surveys utilizing a variety of different, high-resolution methods (morphological and molecular) led not only to the description of many new taxa, but also several supraspecific changes (e.g. Peters and Edmunds 1972; Puthz 1977; Braasch and Soldán 1986; Campbell and Suter 1988; Gillies 1990; Grant and Peters 1993; McCafferty and Waltz 1995; Lugo-Ortiz and McCafferty 1996, 1999; Sartori et al. 2008; Sartori 2014a, b, c.).

The catalogue that follows is arranged alphabetically by species name, followed by the original combination, author(s) name and year of publication. For each entry, an actual nomenclature (valid names or synonymy) is given. The kind of type and the metamorphic stage of specimens are abbreviated as indicated in the table header. The present study is a completely independent and new work; data reported by Weidner were not copied as a base for this catalogue. This study is entirely original work, based on the first author's specimen-by-specimen examination of the ZMH collections from December 2013 to June 2014. Recent publications by Malzacher (2015, 2016) on Ulmer's collection were also added.

Acknowledgements

The authors thank Kai Schütte (Hamburg) for his kind support and encouragement for this project. Comments by Luke Jacobus (Columbus, Indiana, USA) helped to improve the manuscript.

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